

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-7 and 10-15 are currently pending, Claims 1, 6, and 14 having been amended, and Claims 8 and 9 having been canceled without prejudice or disclaimer. The changes and additions to the claims do not add new matter and are supported by the originally filed specification, for example, on original Claims 8 and 9; and Fig. 12.

In the outstanding Office Action, Claims 1, 2, 3, 6, 8, and 13 were rejected under 35 U.S.C. §103(a) as being unpatentable over Onggosanusi et al. (U.S. Pub. No. 2003/0139139, hereafter “Onggosanusi”) in view of Juntti et al. (U.S. Pub. No. 2003/0179814, hereafter “Juntti”); Claims 4 and 5 were rejected under 35 U.S.C. §103(a) as being unpatentable over Onggosanusi in view of Juntti and Walton et al. (U.S. Pub. No. 2004/0082356, hereafter “Walton”); Claims 10-12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Onggosanusi in view of Juntti and Song et al. (U.S. Pub. No. 2004/0120415, hereafter “Song”); Claims 7 and 9 were rejected under 35 U.S.C. §103(a) as being unpatentable over Onggosanusi in view of Juntti and Sugimoto et al. (U.S. Patent No. 6,661,835, hereafter “Sugimoto”); and Claim 14 was rejected under 35 U.S.C. §103(a) as being unpatentable over Onggosanusi in view of Sugimoto.

Applicants note that the Office Action has not addressed dependent Claim 15. Applicants respectfully request that dependent Claim 15 be addressed in any subsequent Office Action from the examiner, and if Claim 15 is not addressed then any subsequent Office Action must be non-final.

With respect to the rejection of Claim 1 under 35 U.S.C. §103(a), Applicants respectfully submit that the amendment to Claim 1 overcomes this ground of rejection. Amended Claim 1 recites, *inter alia*,

wherein the multipath receiving signal demodulating units and the multipath interference canceling units are arranged in stages, a receiving signal received at each of the receiving antennas is inputted to a corresponding multipath interference canceling unit, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage.

Applicants submit that the applied art fails to disclose or suggest at least these features of amended Claim 1.

Onggosanusi is directed to a multiple input multiple output (MIMO) scheme for combining transmit diversity and data multiplexing. Onggosanusi describes that a receiver can directly estimate a channel (see para. [0017]). Onggosanusi also describes methods of interference-resistance detection, which include optimal maximum likelihood detection, linear detection, and iterative detection (see para. [0034]-[0038]).

With regard to original Claim 8, the Office Action takes the position that Onggosanusi also discloses that “the multipath receiving signal demodulation units and the multipath interference canceling units are arranged in stages.” (See Office Action, at page 4, citing para. [0050] of Onggosanusi). Onggosanusi describes an iterative minimum mean square error (IMMSE) detector which is a sequence of N linear MMSE detection stages, where each detection outputs both a hard and a soft estimate of one of N symbols in a detection block (see para. [0050]). However, Applicants respectfully submit this is not the same as having both multipath receiving signal demodulation units and multipath interference canceling units arranged in stages, as defined by amended Claim 1.

Furthermore, with regard to original Claim 9, the Office Action acknowledges that Onggosanusi and Juntti fail to disclose or suggest “when the multipath receiving signal demodulating units are connected in the stages, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M

transmitting antennas using the multipath interference cancelled signal provided by the multipath interference canceling unit.”

Therefore, Applicants respectfully submit that Onggosanusi and Juntti fail to disclose or suggest “wherein the multipath receiving signal demodulating units and the multipath interference canceling units are arranged in stages, a receiving signal received at each of the receiving antennas is inputted to a corresponding multipath interference canceling unit, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage,” as defined by amended Claim 1.

Applicants note that the Office Action relies on Sugimoto to remedy the deficiencies of Onggosanusi and Juntti with regard to original Claim 9. The Office Action takes the position that Sugimoto describes that “each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using the multipath interference cancelled signal provided by the multipath interference canceling unit.” (See Office Action, at page 8, citing col. 18, lines 30-35; col. 21, lines 7-23; col. 23, lines 53-57; and col. 31, lines 21-34).

Fig. 1 of Sugimoto describes a receiving device for a CDMA communication system, which has a hybrid interference canceller (HIC) 12 that cancels interference in received data 10 and estimates and outputs a plurality of user symbols 13 (see col. 5, lines 37-39). Fig. 2 shows that the HIC 12 has three serially connected stages 16, 20, and 24. The first stage 16 performs correlation detection and maximum ratio combination with Rx Data 10 by use of Rake receipt circuits, executes signal correction and decision with the resulting signals in order to estimate the individual users’ symbols and a residual signal 18, and feeds the symbols 18 to second stage 20 (see col. 5, lines 44-49). Stages 20 and 24 have the same

configuration as stage 16 (see col. 5, lines 50-55). Fig. 3 shows that exemplary stage 16 includes a first ICU group or interference canceling unit 26 and a second ICU group or interference canceling unit 30 (see col. 5, lines 65-67). Sugimoto describes that the first ICU group 26 generates a symbol replicas for each of four users #1-4 from the Rx Data 10 and removes the symbol replicas from Rx Data 10 (see col. 6, lines 1-3). The second ICU group 30 also removes symbol replicas for users #5-8 from Rx Data 10 (see col. 6, lines 7-10). The combination of operations of ICU group 26 and 30 produces a residual signal 18. This residual signal 18 is input to stages 20 and 24 discussed above, which successively performs a similar operation to generate symbol replicas for users #1-4 and users #5-8.

Fig. 17 shows a specific configuration of any one of the ICUs in the HIC 12. Sugimoto describes that there are three different estimates 46a, 46b, and 46c of a received symbol particular to a user (user #1 in the example) received from a previous stage which are input to fingers 490, 492, and 494 respectively (see col. 17, line 42 to col. 18, line 48). Each finger executes correlation calculation and channel estimation and outputs new channel data and finger data. In performing the channel estimation within a finger, Sugimoto describes a series of formulas to give a channel estimate of the i th symbol of the m th stage, k th user, and l th path (see col. 18, lines 3-35).

Thus, Sugimoto describes that channel estimation is performed within the interference cancellation units (ICUs) of Sugimoto to produce residual signals having estimated symbols corresponding to a plurality of users.

However, Sugimoto never explicitly describes that there are both multipath receiving signal demodulating units and multipath interference canceling units arranged in stages. On the contrary, the demodulator 6, which is not shown to be in stages, performs the actual demodulation of the signal received from the receiving antenna 4.

Additionally, Sugimoto does not show that the received signal received at the receiving antenna is inputted to the ICU (as a multipath interference canceling unit). On the contrary, the received signal at the receiving antenna 4 is only shown input into the demodulator 6.

Furthermore, Sugimoto never describes that “each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using the multipath interference cancelled signal provided by the multipath interference canceling unit in the upper stage,” as defined by amended Claim 1.

Therefore, Applicants submit that Sugimoto fails to disclose or suggest “wherein the multipath receiving signal demodulating units and the multipath interference canceling units are arranged in stages, a receiving signal received at each of the receiving antennas is inputted to a corresponding multipath interference canceling unit, each of the stages other than the first stage updates a channel coefficient estimated based on a known pilot signal transmitted from the M transmitting antennas using a multipath interference cancelled signal provided by a multipath interference canceling unit in an upper stage,” as defined by amended Claim 1.

Thus, Applicants submit that Sugimoto fails to remedy the deficiencies of Onggosanusi and Juntti with regard to amended Claim 1.

Walton and Song have been considered but also fail to remedy the deficiencies of Onggosanusi, Juntti, and Sugimoto with regard to amended Claim 1.

Therefore, Applicants respectfully submit that amended Claim 1 (and all associated dependent claims) patentably distinguishes over Onggoanusi, Juntti, Sugimoto, Walton, and Song, either alone or in proper combination.

Amended independent Claim 14 recites features similar to those of amended Claim 1 discussed above. Therefore, Applicants respectfully submit that amended Claim 14

(patentably distinguishes over Onggosanusi, Juntti, Sugimoto, Walton, and Song, either alone or in proper combination.

Consequently, in light of the above discussion and in view of the present amendment, the outstanding grounds for rejection are believed to have been overcome. The present application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.



Bradley D. Lytle
Attorney of Record
Registration No. 40,073

Sameer Gokhale
Registration No. 62,618

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)